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Title: **JP10335089A2: DIMMING BURST PULSE GENERATING CIRCUIT FOR BACKLIGHT LIGHTING SYSTEM**

Derwent Title: Burst pulse generating circuit for controlling back-light of LCD - has constant current circuit, with external resistor which offsets the difference of voltage drop between diode and drive transistor and outputs constant current
[Derwent Record]


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1 page

Country: JP Japan
Kind: A

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Published / Filed: **1998-12-18** / 1997-06-03

Application Number: **JP1997000160591**

IPC Code: Advanced: **G02F 1/133**; **H05B 41/392**;
Core: more...
IPC-7: **G02F 1/133**; H05B 41/392;

Priority Number: 1997-06-03 **JP1997000160591**

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SOLUTION: In this constant current circuit, a current value flowing in a diode D1 and a current value flowing in a transistor Q are equal to each other. Even in the case where an external resistor at any resistance value is connected to an external resistor terminal 22b, voltage lowering between a base and an emitter of the transistor Q and voltage lowering in the normal direction of the diode D correspond to each other, and voltage of the external terminal 22b can be set at the reference voltage Vr. Unevenness per each products can be restricted so as to set the constant current value by improving the accuracy of the current voltage of the constant current source in comparison with the external resistor. Charge at a constant current value is performed so as to restrict the unevenness of frequency of a triangle wave generating circuit per each product.

Family: None

Other Abstract Info: DERABS G99-111809 DERG99-111809

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-335089

(43)Date of publication of application : 18.12.1998

(51)Int.Cl. H05B 41/392
G02F 1/133

(21)Application number : 09-160591

(22)Date of filing : 03.06.1997

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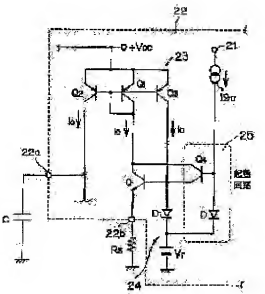
(54) DIMMING BURST PULSE GENERATING CIRCUIT FOR BACKLIGHT LIGHTING SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To restrict the unevenness of frequency of a burst dimming oscillator so as to prevent the interference with a vertical synchronous signal by outputting the constant current output, which is to be decided on the basis of a resistance value of an external resistor connected to a terminal for setting the drive current of a drive transistor and a voltage value of a reference power source, as a current value from a second transistor.



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LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] It has the triangular wave generating circuit in which the current regulator circuit for capacitor charges where a current value is set up by external resistance was established. In the burst pulse generating circuit for modulated light of the back light lighting system with which the frequency of the triangular wave generated according to said current value is determined, and the repeat frequency of burst pulse generating is set up according to this triangular wave The current Miller circuit which said current regulator circuit uses the 1st transistor as an input transistor, and uses the 2nd and 3rd transistor as an output transistor, It has the series circuit of the drive transistor which drives said 1st transistor, and the diode and the reference supply which receive the output current of said 3rd transistor. By the terminal voltage of said diode of said reference supply and opposite side being connected to the control terminal of said drive transistor, and connecting said external resistance to the terminal which sets up the drive current of said drive transistor The burst pulse generating circuit for modulated light of the back light lighting system outputted from the 2nd transistor by making into said current value the constant current output for which it opts with the resistance of this external resistance, and the electrical-potential-difference value of said reference supply.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the burst pulse generating circuit for modulated light which suppresses in detail dispersion in the stability by the frequency of the oscillator for burst modulated light in the booster circuit which drives a back light about the burst pulse generating circuit for modulated light of a back light lighting system, and can prevent interference with a Vertical Synchronizing signal.
[0002]
[Description of the Prior Art] Conventionally, as a back light arranged on the background of liquid crystal, the cold cathode tube is usually used. The lighting electrical potential difference of a cold cathode tube is as high as about 200V-300V, and this has been obtained by carrying out the pressure up of the about [5V-6V] electrical potential difference. Therefore, although an inverter circuit is used, recently, as for the lighting circuit of this, the inverter circuit using not an inverter but the piezoelectric transformer of a solenoid operated system is increasingly used from the request of a miniaturization. Moreover, in this kind of drive circuit, in order to modulate the light of a back light, the oscillator for burst modulated light of PWM control is built in.
[0003] Drawing 2 is a cold cathode tube lighting system for liquid crystal back light lighting which has this kind of driving pulse generating circuit. 30 is a cold cathode tube lighting system, as for a piezoelectric transformer drive circuit and 6, the driving pulse generating circuit and 5 are [a piezoelectric transformer and 7] cold cathode tubes, and 1 is the so-called cold cathode fluorescent lamp. And 8 is a burst oscillator circuit for modulated light (following burst oscillator circuit). a driving pulse -- generating -- a circuit -- one -- 60 -- kHz - 150 -- kHz -- about -- a variable frequency -- a pulse -- an oscillator circuit (VFO) -- two -- a flip-flop -- (-- FF --) -- three -- a flip-flop -- three -- an output -- respectively -- winning popularity -- a buffer -- amplifier -- four -- a -- four -- b -- from -- becoming -- a flip-flop -- (-- FF --) -- three -- Q -- an output -- and -- this -- reversal -- a side -- an output (following Q Bar output) -- respectively -- a buffer -- amplifier -- four -- a -- four -- b -- minding -- a piezoelectric transformer -- a drive -- a circuit -- five -- adding -- having . Moreover, in a stationary point LGT condition, the frequency is the oscillator circuit by which automatic control is carried out, and the pulse oscillator circuit 2 is controlled to become a predetermined oscillation frequency from error amplifier 4c which generates an error signal according to an error with reference voltage generating circuit 4b in response to a control signal. In addition, the voltage signal from which the input by the side of detection of error amplifier 4c changed the tube electric current of a cold cathode tube 7 into the electrical potential difference through Resistance R is applied.
[0004] The burst oscillator circuit 8 consists of the triangular wave generating circuit 9, the PWM driving pulse circuit 10 and a gate circuit 11, an PWM slice electrical-potential-difference generating circuit 12, a resistance circuit 13 for external modulated light, and a constant current source 14, and, in addition to the gate of the drive transistor Tr of FET, switches this for the burst pulse output of the PWM driving pulse circuit 10 through a gate circuit 11. The drive transistor Tr is a transistor prepared in the

piezoelectric transformer drive circuit 5, and has become the switching circuit which supplies power to flyback switching circuit 5a from power-source Rhine Vcc. Then, the pressure-up electrical potential difference to generate is controlled by the burst drive of this drive transistor Tr being carried out, and PWM control of between the nascent states of that driving pulse being carried out, it has, and the light of a cold cathode tube 7 (back light) is modulated. In addition, the driving pulse generating circuit 1 and the burst oscillator circuit 8 of a dotted-line frame are an IC-ized circuit. Here, the PWM driving pulse circuit 10 consists of comparator 10a and comparator 10b, and comparator 10a receives the output of the pulse oscillator circuit 2 of a variable frequency in a reference voltage input (- side input) as a triangular wave through external capacitor 2a. And the 60kHz - about 150kHz driving pulse by which PWM control was carried out by comparing these with a signal input side (+ side input) in response to the electrical potential difference of the PWM slice electrical-potential-difference generating circuit 12 is generated. The PWM slice electrical-potential-difference generating circuit 12 changes the drive current of the upstream of a piezoelectric transformer 6 into an electrical-potential-difference value through resistance circuit 6a, and generates the electrical potential difference by which automatic level control was carried out by winning popularity as this feedback electrical potential difference, and comparing this with reference voltage VREF.

[0005] Comparator 10b is received in a reference voltage input (- side input) from a constant current source 14 as a slice electrical potential difference of PWM control of the electrical potential difference generated according to the current passed in the resistance circuit 13 for modulated light, and the 150Hz window pulse by which PWM control was carried out by comparing these with a signal input side (+ side input) in response to the output of the triangular wave generating circuit 9 is generated. A gate circuit 11 consists of 2 input AND-gate 11a and inverter 11b in which one input has a negative logic input. Receive the output of comparator 10a in one input of AND-gate 11a, and the output of comparator 10b is received in the negative logic side input of AND-gate 11a, respectively. The burst pulse by which PWM control was carried out as shown in drawing 3 by making the LOW level period of comparator 10b into a window period is generated, and, in addition to the gate of the drive transistor Tr, this is driven through inverter 11b. The LOW level period (window width) of comparator 10b at this time is controlled by the resistance circuit 13 for modulated light, and that frequency of it is the same as that of the triangular wave generating circuit 9. Here, the triangular wave generating circuit 9 is a circuit which has the constant current source on the upstream and a lower stream of a river, and carries out the charge and discharge of the capacitor C, as shown in drawing 4 . That is, the triangular wave generating circuit 9 consists of the charge-and-discharge circuit 15, comparators (COMP) 16 and 17, and a flip-flop (FF) 18. That oscillation frequency is determined by the charge-and-discharge circuit 15 having the capacitor C for charges and discharges, and carrying out the charge and discharge of this capacitor C. Therefore, the voltage stabilizers 15a and 15b for charges and discharges are established in the charge-and-discharge circuit 15. A triangular wave with a linear ramp can be generated by charge and discharge being performed by constant current.

[0006] The comparator 16 has power-source 16a of reference voltage VH1 as criteria side input voltage. The signal input side undergoes the output (voltage signal of a triangular wave) of the charge-and-discharge circuit 15 as an input signal. A comparator 17 also undergoes the output of the charge-and-discharge circuit 15 as an input signal as criteria side input voltage. The signal input side receives the reference voltage VL 1 from power-source 16b of reference voltage VL 1. Here, it has the relation of VL1<VH1. In addition, the charge-and-discharge circuit 15 generates an output in coincidence at the output terminal (it is the same as terminal 15c of Capacitor C) of the triangular wave generating circuit 13. A comparator 16 generates a detection pulse, when the electrical potential difference of the triangular wave inputted exceeds an electrical potential difference VH1, and it inputs this output into the set side (S) of the flip prop 18. The flip prop 18 is set to "1" by this, and Q output occurs in this. Moreover, a comparator 17 generates a detection pulse, when the electrical potential difference of the triangular wave inputted falls from an electrical potential difference VL 1, and it inputs this output into (R) the reset side of the flip prop 18. The flip prop 18 is reset by "0" by this, and Q output stops. And if Switch SW is turned ON, discharge of Capacitor C will be started by constant current source 15b.

[0007] The charge-and-discharge circuit 15 consists of series circuits of constant current source 15a of the current value I1 inserted between power-source Rhine Vcc and Gland GND, and Switch SW and constant current source 15b of a current value I2. The node of constant current source 15a and Switch SW is connected to the charge-and-discharge terminal (terminal 15c) of Capacitor C. Switch SW is turned ON when Q output of the flip prop 18 occurs, and when Q output of the flip prop 18 stops, it is turned OFF. So, when Switch SW turns off, charge is performed to Capacitor C. When Switch SW turns on, discharge is performed to Capacitor C. In addition, the current value I2 of constant current source 15b is usually set as about about 2 times of the current value I1 of constant current source 15a.
[0008]
[Problem(s) to be Solved by the Invention] If it is in the back light lighting system which has the burst pulse generating circuit for modulated light of such PWM control, it adjusts and has between burst pulse nascent states by choosing the slice level of the output of the triangular wave generating circuit 9, and the luminescence brilliance control of a cathode-ray tube is carried out. The frequency in this case is about 150Hz, and is set as the value near 120Hz which is a twice as many higher harmonic as the frequency of the 59Hz - 60Hz Vertical Synchronizing signal for image display. If this frequency is made higher, the range of modulated light will become narrow, if this frequency is made low, it will interfere with a Vertical Synchronizing signal, or it becomes a noise to a Vertical Synchronizing signal, and the problem on which an image is confused is produced.
[0009] Since it is such, the frequency which the triangular wave generating circuit 9 generates needs to be maintained before and behind 150Hz, without varying for every product. Then, current regulator circuit 15a as shows constant current source 15a by the side of charge of a triangular wave generating circuit to drawing 5 is used. That is, it consists of drive transistors Q which drive the bias circuit 19 which has the source Vr of reference voltage which generates reference voltage Vr, and the current mirror 20 and the current mirror 20 to the interior. A bias circuit 19 operates in response to the seizing signal from a control circuit (not shown) for a terminal 21, consists of a series circuit of current source 19a which flows out the current of a current value I3, and the Diode D and the source Vr of reference voltage which were connected between the output of current source 19a, and Gland GND, and carries out bias of the base of Transistor Q on a fixed electrical potential difference by these. It is set up so that an electrical potential difference with 15d equal to the internal reference voltage VR of external terminals which connect the external resistance Rs may occur by this. And the current value (however, Rs, resistance of Resistance Rs) of Vr/Rs is outputted to output terminal 15c of the current mirror 20. Then, the current value I0 of this constant current source can be set up from the outside by the external resistance Rs.
[0010] Here, the reason for carrying out external [of the external resistance Rs] is that it changes the current value of the upstream in a triangular wave generating circuit for every model. Usually, if it is in this kind of back light drive circuit, a circuit can use it in common for a cost reduction. However, if the current value of a constant current source is set up by the external resistance Rs, dispersion in the resistance for every product will affect dispersion in the constant current value I0 upwards, and it will be easy to produce dispersion in the electrical-potential-difference value of external terminal 15c. The reason is that the electrical potential difference of the base-emitter of Transistor Q changes with the current values I0 passed in addition to dispersion in resistance, and this stops corresponds with a part for the voltage drop of Diode D. According to it, the frequency of the previous triangular wave generating circuit where the current value of a constant current source determines the repeat period of burst pulse generating by dispersion becoming large is changed, and it lifting-comes to be easy of a Vertical Synchronizing signal and interference. Therefore, the purpose of this invention is to offer the burst pulse generating circuit for modulated light of the back light lighting system which can solve the trouble of such a conventional technique, can suppress dispersion in the stability by the frequency of the oscillator for burst modulated light in the booster circuit which drives a back light, and can prevent interference with a Vertical Synchronizing signal.
[0011]
[Means for Solving the Problem] The description of the burst pulse generating circuit for modulated

light of the back light lighting system of this invention for attaining such a purpose It has the triangular wave generating circuit in which the current regulator circuit for capacitor charges where a current value is set up by external resistance was established. In the burst pulse generating circuit for modulated light of the back light lighting system with which the frequency of the triangular wave generated according to the aforementioned current value is determined, and the repeat frequency of burst pulse generating is set up according to this triangular wave The current Miller circuit where a current regulator circuit uses the 1st transistor as an input transistor, and uses the 2nd and 3rd transistor as an output transistor, It has the series circuit of the drive transistor which drives the 1st transistor, and the diode and the reference supply which receive the output current of the 3rd transistor. By the terminal voltage of the diode of a reference supply and the opposite side being connected to the control terminal of a drive transistor, and connecting external resistance to the terminal which sets up the drive current of a drive transistor The constant current output for which it opts with the resistance of this external resistance and the electrical-potential-difference value of a reference supply is outputted from the 2nd transistor as the aforementioned current value.

[0012]

[Embodiment of the Invention] Thus, by the current mirror which has two output side transistors, it is made to output the same current as the drive current of a drive transistor, and the current which flows to diode, and the current which flows to a drive transistor are substantially made equal by passing to the series circuit which has the diode of a bias setup of one output of a drive transistor. The voltage drop of a drive transistor and diode is made equal by this irrespective of the resistance by which external is carried out, and a difference of the voltage drop between these is made to offset. Then, the external resistance connected in order to set up the drive current of a drive transistor can receive the same electrical potential difference as the electrical-potential-difference value of a reference supply prepared in the interior through a connection terminal. Consequently, since an output current value can be determined depending on the resistance of external resistance, dispersion in the substantial constant current value of a constant current source will be based on dispersion in external resistance. Therefore, dispersion in a burst pulse generating frequency can be held down by suppressing dispersion in this external resistance to the range which does not interfere in a Vertical Synchronizing signal.

[0013]

[Example] Drawing 1 is the block diagram of the current regulator circuit by the side of charge of the triangular wave generating circuit of one example which applied the burst pulse generating circuit for modulated light of the back light lighting system of this invention. In addition, the same sign shows the same component as drawing 5 , and it omits the explanation. In drawing 1 , 22 is a current regulator circuit in constant current source 15a by the side of charge of the triangular wave generating circuit 9 of drawing 4 , and consists of the current mirror 23, a bias circuit 24, and bootstrap circuit 22a. Moreover, it has output terminal 22a of constant current, and external resistance terminal 20b. The current mirror 23 uses the transistor Q1 of an PNP form as an input-side transistor, and uses the transistors Q2 and Q3 of an PNP form as an output transistor. Diode connection of the input-side transistor Q1 is made.

[0014] The collector of a transistor Q2 is connected to output terminal 22a, the collector of a transistor Q1 is connected to the collector of the drive transistor Q of an NPN form, and the emitter of the drive transistor Q is connected to external terminal 22b. Moreover, a bias circuit 24 is a series circuit which consists of diode D1 by which the transistor Q3 of the current mirror 23 was connected to the collector of this as an upstream current source in the forward direction, and a source Vr of reference voltage. Diode D1 is the diode corresponding to the diode D of drawing 3 . Although a bootstrap circuit 25 corresponds to the bias circuit 19 of drawing 5 , the transistor Q4 is further formed in this. the base of a transistor Q4 is connected to the output of current source 19a -- having -- the -- ** -- it connects with the collector and emitter of Transistor Q, respectively, and the collector and the emitter have the same composition as the circuit which consists of a transistor Q in drawing 5 , and a bias circuit 19. Thereby, this constant current source 22 can be operated according to the seizing signal from a control circuit (not shown) as usual.

[0015] Furthermore, if it is in such a circuit, the current value which flows to diode D1, and the current

value which flows to Transistor Q become equal substantially. Therefore, even if it is the case where external resistance of what kind of resistance is connected to external resistance terminal 22b, the voltage drop between the base emitters of Transistor Q and the forward voltage drop of Diode D correspond. Thereby, the electrical potential difference of external terminal 22b can be set as reference voltage Vr. Then, it becomes possible to suppress dispersion for every product and to set up a constant current value because precision improves the current value of this constant current source by external resistance. Consequently, dispersion for every product of the frequency of the triangular wave generating circuit which charges with this constant current value and generates a triangular wave can be suppressed.

[0016] A transistor may be an FET transistor although are explained above, and the example of a bipolar transistor is given in the example. Moreover, of course, a negative supply may be used, in that case, the transistor of an PNP form serves as an NPN form, and the transistor of an NPN form serves as an PNP form. Moreover, in the example, although the example of the constant current source of a liquid crystal back light lighting system is given, this invention is applicable not only to a liquid crystal back light lighting system but a constant current source which carries out the brilliance control of the back light of other lighting systems.

[0017]

[Effect of the Invention] If it is in this invention, since it makes the voltage drop of a drive transistor and diode equal irrespective of the resistance by which external is carried out and he is trying to offset a difference of the voltage drop between these as explained above, the external resistance connected in order to set up the drive current of a drive transistor can receive the same electrical potential difference as the electrical-potential-difference value of a reference supply prepared in the interior through a connection terminal. Consequently, since an output current value can be determined depending on the resistance of external resistance, dispersion in the substantial constant current value of a constant current source will be based on dispersion in external resistance. Therefore, dispersion in a burst pulse generating frequency can be held down by suppressing dispersion in this external resistance to the range which does not interfere in a Vertical Synchronizing signal.

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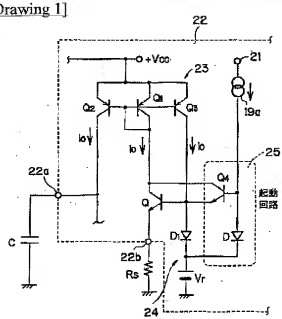
DRAWINGS

[Drawing 1]



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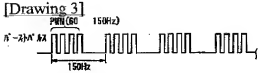

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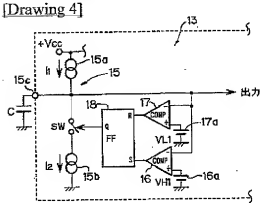
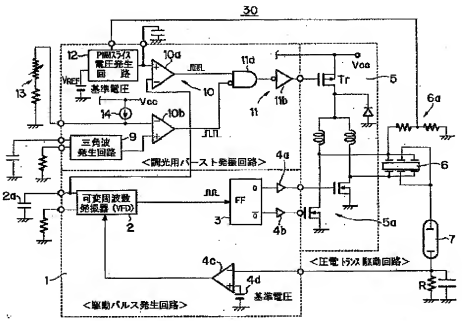
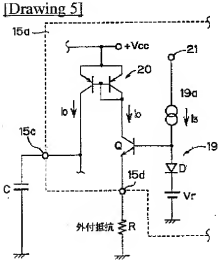


[Drawing 2]



[Drawing 5]



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